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14. ABSTRACT

Analysis of the data set obtained during the 1996-97 summer and autumn deployments of ADCP and T-logger internal wave antennas of Mission Beach, CA was the principle activity during the reporting period. The PhD Thesis of Jim Lerczak, completed during the reporting period, set forth the results (subsequenmtly published). The main results are (1) descriptions of internal (diurnal and semidiurnal) tides and higher frequency internal waves over the slope and shelf with longer time series and with much finer spatial and time resolution than previous descriptions, (2) understanding where these fields are generated, where they are strongly damped, and how they are made intermittent by lower frequencycurrents.

is a compression bulge where the marine layer thickens and slows.

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Origin and Structure of Nearshore Internal Tides and Waves; Data Analysis and Linear Theory.

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Analysis of the the data set obtained during the 1996-97 summer and autumn deployments of ADCP and T-logger internal wave antennas of Mission Beach was completed, the results were written up in the PhD thesis of Jim Lerczek and subsequently published (Lerczak et al, Journal of Geophysical Research-Oceans. 108(C3):3068, 2003; Lerczak et al,Journal of Geophysical Research-Oceans, 106(C9):19715-19729, 2001). The most important results, sorted by frequency band, are as follows:

Diurnal Band (1/36 to 1/18 cph)

1. Diurnal-band internal waves were surface enhanced, and phase lines propagated
upward, suggesting a downward energy flux and a surface source, the remarkably
monochromatic diurnal local seabreeze, for the motions.
2. While the diurnal currents were energetic, they were intermittent in time. Much of this intermittency was found to be due to changes in the background vorticity field.

Semidiurnal Band (1/14.5 to 1/11 cph) Internal Tides

1. Semidiurnal-band currents on the slope were predominantly oriented in the along isobath direction, suggesting that energy propagated in the along isobath direction. Currents were bottom-intensified and were consonant with a northward-propagating, bottom-trapped wave, trapped on the slope.
2. Semidiurnal currents on the shelf had a unique structure not reported elsewhere in the literature. Semidiurnal currents near the surface were clockwise-circularly polarized, while currents near the bottom were linearly polarized in the cross-isobath direction.
3. Vertically-averaged semidiurnal currents on the shelf did not behave like the surface tide. While they were oriented in the along-isobath direction, their amplitude and phase were not stable over time, unlike the surface tide. These motions may be the shelf response to larger scale slope/shelf motions such as Kelvin wave or bottom-trapped waves.
4. Residual, semidiurnal-band currents (currents remaining after vertical average was removed) behaved very much like onshore-propagating, partially-reflected, mode-one internal waves. The reflection coefficient varied seasonally, being highest in the summer and lower in the fall.
5. The square coherencies between the semidiurnal-band currents and the surface
tide were as high as they could be, given the observed degree of smearing out of tidal lines in the currents.

High-frequency (1 cph to 1/2 cp min) Internal Waves

1. The vertical structure of the high-frequency internal waves was consistent with onshore-propagating, mode-one internal waves. However, the vertical structure was frequency dependent in a way not obviously explained by either linear or weakly-nonlinear theory.

2. The phase speed of these waves decreased as the waves shoaled (propagated into shallow water) in a manner consistent with linear theory.

3. The high frequency waves were well developed and traceable shoreward from the 30 mooring to the 15 m mooring but, remarkably, they rarely had high frequency predecessors further offshore at the 70 and 120 m moorings.

4. The high frequency waves were highly dissipative, losing approximately 75% of their energy while propagating across the 1.5 km cross shore distance separating the 30 m mooring from the 15 m mooring.